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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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July 27, 1929

A FLYING LABORATORY

Actual Tests Reveal Aerial Radio Problems

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Warns of Sunburn Dangers

Hygiene

With the present vogue of tanned skins and with our new knoweldge of the health-giving properties of the sun's rays, the danger of severe burns from overexposure to the sun is apt to be forgotten.

A severe sunburn may be dangerous as well as uncomfortable. Burns from the sun's rays are comparable to any other kind of burns, and may even result fatally.

"With all its curative power, sunshine may become a menace to health when improperly used," warned Dr. James S. Walton of the New York State Department of Health. "The blistering caused by sunshine does not differ in any way from the blistering caused by fire or by live steam. Its destructive action on the skin is the same. Extensive sunburn causes the same high fever, delirium, serious meningitis. Death may follow as in similar burns by other agencies."

Blondes and red-haired people are especially susceptible to sunburn. Some fail to tan at all but acquire a red, painful burn with every fresh exposure to the sunshine. Whether you will have one of these painful, lobster-red burns or just a fashionable coat of tan depends somewhat on the pigment of your skin. However, the best way to acquire the desired tan without danger or discomfort is to go at it gradually, keeping out of the hot sun during the middle of the day in summer time.

"If you would develop a tan, begin with five to ten minutes daily, before ten o'clock or after three. Increase the time of exposure daily by five to ten minutes, and in a week, in most cases, a light tan without burning will have appeared. When this occurs, danger of subsequent burning is slight and the sun's healthful rays may be utilized freely," explained Dr. Walton.

The desired tan cannot be acquired in one heroic attempt, as so many seem to think. Exposure to the hottest sun for several hours the first day results in a painful burn, which blisters the skin so that it all peels off and the process must be started over again on the even more sensitive new skin.

Young children burn more quickly than adults and especial care must be taken to protect them. Severe burns resulting fatally to children are reported every year from seaside resorts, Dr. Walton stated.

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Emotions Important in Getting Skill

Psychology

If you have played tennis for years and set out to learn golf, will your tennis skill aid or hinder? Popular views on this question of transfer of skill are varied and conflicting, but experiments and analyses of bodily motion have produced some facts to go on, according to Prof. T. H. Pear, of the University of Manchester, given in a report to the British Association for the Advancement of Science.

The mental attitude and the emotions of the learner play an important role in his ability to make use of past experience. If he enjoyed the old skill and felt confidence in his powers, for example, this mental attitude may be transferred to the new task with favorable results.

"The attitude of analyzing movements, of demanding to know the reasons for them, the sentiments and ideals formed in connection with a particular teacher, or his method of regarding a certain skill, are probably the most powerful vehicles of transfer," Prof. Pear said.

Experiments have indicated that the transfer of skill from one sport or task to another is very much less than might have been naively supposed, he stated. The world's best exponents of any complex skill are usually very careful to be specialists. There are even good grounds for feeling that if an expert in one sport learns a new complex sport he may interfere with his old skill.

"For example, while a figure-skater learns always to lean towards the direction of his turns, a ski-runner may have to lean either towards or away from the direction," Prof. Pear explained. "An expert skater would find this very difficult to unlearn, while a novice at both sports would find less difficulty. Similarly, the oral learning of two foreign languages in the same year may cause interference."

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A Flying Laboratory

Radio

The flying radio laboratory of the Bell Telephone Laboratories is shown on our cover this week. Fully equipped with radio receiving and transmitting apparatus, this plane reveals the problems that the telephone engineers will have to confront when aerial travel is as common as railroading, and the flying traveller will want to keep in touch by telephone with his office. This is the plane from which telephone conversations were recently held with London.

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Africa Scene of Nature's Greatest Effort

General Science

Africa may, as Darwin suggested, be the "scene of nature's greatest creative effort." This may be proven by future anthropological researches on the once "dark" continent, said Prof. Jan A. Hofmeyr, president of the South African Association for the Advancement of Science. He spoke on "Africa and Science" at the opening session of the Cape Town meeting of the British Association for the Advancement of Science and the South African Association.

"It would seem to be not without significance that Africa possesses in the chimpanzee and the gorilla those primate types which approach most nearly the form and structure of primitive man," he said. "To that must be added that in the Bushman, Pygmy, and negroid races Africa has at least two and possibly three early human stocks which are characteristically her own and belong to no other continent. No less striking is the fact that in Gibraltar, in Malta, and in Palestine, that is, at each and every one of the three portals into Africa from Europe and Asia in Pleistocene times, there have been discovered evidences of the presence of Neanderthal man. In Africa itself there was found at Broken Hill some nine years ago a skull with the most primitive or bestial facial form yet seen, and so closely akin to the Neanderthal stock as to establish firmly the expectation of finding further compelling evidence of a long continued Neanderthaloid occupation of the African continent. The discovery at Taungs on the one hand, which reaches out towards the unknown past, and the finds at Boskop and in the Tsitsikama on the other, which assist in linking up the period of Rhodesian man with the coming of the Bushfolk, open up to us, in conjunction with the aforementioned facts, a vista of anthropological continuity in Africa such as no other continent can offer. The recent investigations in the Great Rift Valley, near Elementeita in Kenya, and the fossil discoveries on the Springbok Flats, north of Pretoria, have again fixed the attention of the anthropologist on Africa."

Medical science and animal biology also have a big field in Africa.

"In the African continent," he continued, "there is no lack of opportunity to advance Science by physiological inquiries into animal structure, by the isolation of the parasites of human and animal diseases, and by the tracing of the life histories more especially of the minuter forms of animal life. 'Nowadays' in the words of Professor J. A. Thomson, 'the serpent that bites man's heel is in nine cases out of ten microscopic.' But scarcely less important are the extensive facilities which Africa still offers for the study of the habits and behavior of the larger mammals."

Though the first extensive astronomical observations in South Africa were made as early as 1750, the Royal Observatory at the Cape was established in 1821 and Sir John Herschel made a famous series of observations between 1833 and 1838, it has been within the last few years that it has become an extensive astronomical center. Comparing the situation in 1905, when the Association first met in South Africa, with the present, Prof. Hofmeyr stated:

"The two Observatories of 1905, our visitors will find, have increased to six, including the Smithsonian Solar Observatory in South-West Africa, and the equipment of these institutions includes four great telescopes, with objectives of 27 inches, 26½ inches, 26 inches, and 24 inches, respectively, to which will shortly be added a 24-inch refractor and a 60-inch reflecting telescope—surely a remarkable astronomical equipment for so young a country. The stimulus of the 1905 visit, in which so many prominent European astronomers participated, has indeed borne rich fruit in the advancement of astronomical work in South Africa."

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"Impossible" Electron Movements

Physics

By the shifting of electrons in atoms in ways formerly thought impossible, cosmic mysteries such as the strange green lines in the spectrum of the northern lights are to be explained. So stated Lord Rayleigh, famous British physicist in his address as president of the section on physics and astronomy of the British Association for the Advancement of Science.

"In discussing the nebular and auroral spectra, we encountered the idea of 'metastable states'," he said. "At present this conception is not in a very satisfactory condition. The original idea was of a state which did not allow of direct transition by emission of radiation to the stable ordinary state. Let us compare the level of the atom to the stories of a building and the optical electron to a man inside the building. The ordinary state of the atom is represented by the man being on the ground floor, and the metastable state by placing him on the first floor. But the internal architecture of our building must be pictured as peculiar. A staircase connects the first floor with the second floor, and another staircase connects the second floor with the ground floor: but there is no connection between the first floor and the ground floor except by going up higher and coming down again.

"Such, I say, was the original conception, but facts which have since come to light require some revision of it.

"In the nebulae the electron manages somehow to escape from its prison-house, and descend to the level below not by the legitimate route of going upstairs and down again, but by illicitly breaking through the floor, contrary to the rules of the establishment."

In his own experiments, Lord Rayleigh has obtained spectral lines resulting from such "forbidden" changes.

On account of such experiments, he said, "It has even been proposed to define a metastable state as one with a low probability of transition. This takes us far from the original conception, and makes 'metastability' merely a question of degree. Some recent results which I hope to bring before the section at a later stage in our proceedings seem to indicate that even the normal excited state may possibly persist for a much longer time than has hitherto been supposed. If this conclusion is accepted, a far-reaching revision of our present notions may become necessary. The general softening of outline in our picture of atomic events resulting from the substitution of wave groups for particles seems likely to afford what is required, and to allow the occasiona' transition downward from a metastable state."

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Growth Vitamin Found in Milk

Physiological Chemistry

Milk contains a hitherto unrecognized factor, which is vitamin in character, and is essential for the growth of chicks and for the prevention of a peculiar type of paralysis which results in incurable deformities if long continued, according to an experiment recently finished by L. C. Norris, G. F. Heuser and H. S. Wilgus, Jr., of the Cornell University agricultural experiment station. It is possible that the effects obtained from this factor have previously been credited to vitamin B.

The discovery was accidental to a certain extent and resulted from an attempt to get a chick ration low in calcium and phosphorus, which would be suitable for studying the requirements of chicks for these minerals. In order to be satisfactory such a ration should produce a rate of growth, when properly supplemented with calcium and phosphorus, equal to that obtained by good poultrymen.

Since milk, meat scrap and fish meal are rich sources of these minerals, it was decided to use casein, a purified milk protein, as the main source of protein in the experimental ration. This protein contains only mere traces of vitamin B.

Its lack of this vitamin was considered a serious difficulty. To overcome it, resort was made to a milk vitamin B concentrate furnished by a commercial company. This concentrate has been shown to be as rich as yeast in vitamin B.

White Leghorn chicks were used to determine the value of the ration. They were divided into three lots, A, B, and C. Each lot contained 30 chicks.

Lot A was fed the experimental ration, supplemented by 7.14 per cent. of the milk vitamin B concentrate, while lot B received the same ration plus 2.68 per cent. of the concentrate. These quantities of the vitamin concentrate represented respectively the approximate amounts of vitamin B in 20 per cent. and 7 per cent. dried milk, and corresponded to two rations already giving satisfactory growth in experimental work.

For the first two weeks all lots grew at about the same rate. However, at the end of the third week, lot C, which received the unsupplemented ration, had fallen behind in growth. It never again equalled the other lots, although toward the end of the experiment this lot partially recovered and developed at the same rate as the other lots.

In addition to the slow growth a peculiar type of leg weakness, entirely distinct from rickets, appeared in lot C at the third week. The birds lost the use of their legs to a large extent and frequently walked on their hocks. The toes curled up and in the advanced stages the birds lay upon the floor with legs sprawled out.

The affected birds failed to grow normally and several died. The skin of these birds was harsh and dry. Approximately 50 per cent. of this lot was lame at the end of the fifth week.

In lot B two cases of lameness occurred during the third and fourth weeks. One of them died at 7 weeks and the other failed to grow to any extent throughout the remainder of the experiment.

Attempts to cure severe cases of this deformity by means of yeast and the milk vitamin B concentrate failed, although they were hand fed definite quantities of these products for two weeks.

No lameness developed in lot A, but one chick with slightly crooked toes was observed at the twelfth week. Whether or not this was a mild attack of the condition described could not be determined.

It is apparent from these results that this so-called milk vitamin B concentrate contains some factor which accelerates the growth of chicks and prevents a certain type of leg weakness or paralysis. It does not appear that the two vitamins into which vitamin B has recently been divided can be credited with producing these effects. For present purposes these vitamins may be called B-1 and B-2.

It would be unwise, however, to conclude from this experiment that milk should be invariably used in all poultry rations. Good chicks have been reared in the past with little or no milk. Good winter egg production has also often been obtained with rations which contained no milk.

Science News-Letter, July 27, 1929

Smoke Cigarettes Slowly

Physiology

Smoke cigarettes with small intermittent puffs, taking ten minutes to each cigarette. Throw a cigarette away when the stump is still long. Don't inhale. Pick an oriental tobacco. Don't smoke before meals.

This is good advice to those who must smoke, as extracted from the scientific report of Dr. Emil Bogen of Cincinnati, who, with cigarette smoking machines and human smoke testers, investigated more than fifty different brands of tobacco on the market. Talking before the American Medical Association meeting, Dr. Bogen explained his extensive researches.

Nicotine is not the only injurious agent in cigarette smoke. Aldehydes, similar to poisonous compounds in bootleg liquor, are formed during the combustion of the tobacco; ammonia is contained in the fumes from smoldering cigarettes; heat of the smoke is harmful to the mouth; and tarry substances, sometimes called tobacco oil, are irritating. Headaches and other effects are caused by the inhalation of carbon monoxide contained in smoke.

Dr. Bogen discovered that simply holding a lighted cigarette in the hand produced more toxic materials in the room air than result from active smoking when smoke is drawn through tobacco and into the mouth. Smoke from the burning end is of more consequence to non-smokers who breathe it than to smokers who indulge moderately. Smoke from the cigarette's end contains most of the material of the cigarette, and Dr. Bogen's analysis shows that it contains a considerable amount of ammonia, a chemical that causes eye and nose irritation. But smoke from the lighted end has little of the deadly carbon monoxide, such as is present in smoke drawn swiftly into the mouth.

Radical difference in nicotine content of the inhaled smoke, depending upon the rate of smoking, caused Dr. Bogen to recommend slow and short puffing. Fast and furious smoking makes it possible to carry into the system with the smoke half of the cigarette's nicotine content.

Discovery that stumps of partially smoked cigarettes act as filters and catch nicotine, increasing the stump's narcotic content by two-thirds, caused Dr. Bogen to suggest smoking cigarettes only half way.

Science News-Letter, July 27, 1929

Scientist Tells of Life Among Ants

Entomology

By Marjorie MacDill

On a sunny afternoon some seventy-five years ago a little boy was playing alone in a charming flower-filled garden on the shores of Lac Leman. Through the long French windows came the sound of one of Beethoven's sonatas. In spite of the beauty of his surroundings, the little boy was lonely and longed with a large and immense longing for the comradeship of unwashed urchins in the nearby village. But the edict of the author of the piano notes floating out through the clear Alpine sunshine was absolute. Perhaps Mother feared the contaminating effect of the local dialects, of variety and intonation innumerable in Switzerland, on the pure French accents of her son.

However that may be, the boy playing on the terraces, so common in Swiss gardens, made a discovery. There between the stones that made the steps of the terrace was an energetic colony of ants carrying on a most diverting number of fascinating activities. Thereafter the little fellow was no longer lonesome.

"Thus it was," says Dr. Auguste Forel, M.D., Ph.D., member of the French Academy of Sciences, and former professor at the University of Zürich, "that from the age of five, ants, wasps, snails, little creatures in general and ants in particular, were my delight. There were big ants, little ants, black, red and yellow ants. And then, inside their nests, which I overturned, there were little white worms and motionless white cocoons looking as if they were swaddling clothes. I watched the nimble ants bearing all these curious things with jealous care; but neither my mother nor I could tell what it all meant. These white objects could not possibly be eggs, because they were often as big as the ants themselves, occasionally bigger. Sometimes winged ants could also be seen inside the nest.

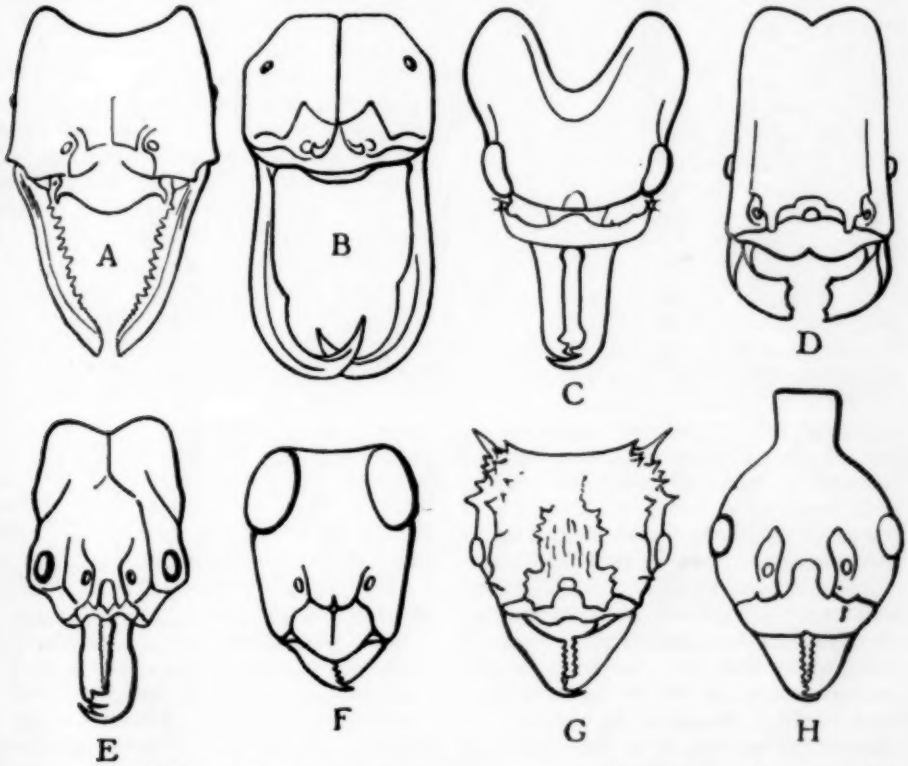
AUGUSTE FOREL. . . . "In fury I poured boiling water on the reds, but all in vain"

"Why did the ants of the terrace —my particular friends—live together with complete understanding, cooperating one with another and taking their food in common when I gave them bread or honey, while they fought savagely with the inhabitants of other colonies?

"One fine day, my black friends of the terrace were attacked by a troop of large red ants with black bellies. I wanted to help them but was taken away to go for a walk. I was then seven and a half years old. When I came back I saw that the nest of my poor friends had been invaded by the red ants, which had driven the others away and, were carrying off their cocoons. In my fury I poured boiling water on the reds, but all in vain. Then I followed them to their nest, about 40 or 50 feet away at the edge of a path. In their midst, I was astonished to find black ants smaller than themselves, just like my friends of the terrace, but living in common with them. Could these be slaves, hatched in this nest from cocoons which had formerly been stolen? Even then I put the question to myself, but was not able to answer it."

Eventually this embryo entomologist grew up to attain a widely heralded name in the fields of medicine, psychiatry and neurology and wrote, among other things, one of the soundest and most comprehensive treatises on that all important subject, sex, that we have in any language; but always he returned to his first love, the ants. Ants with appendages to drill through the brains of their enemies and kill them by paralysis, ants that make slaves, ants that grow mushrooms, ants with beards, ants deformed and hermaphroditic, ants that hoard grain, ants that milk "cows," ants that make paper and ants that weave, all were grist for the busy mill of his mind.

Finally, in the autumn of a long and busy life, (*Turn to next page*)



ALL ANTS LOOK ALIKE? . . . . Oh no! They vary as much as people, as these eight ant faces show. (All illustrations from "The Social World of the Ants," published by A. and C. Boni)

A Life Among the Ants—*Continued*

this learned Herr Professor Dr. Forel of Zürich came to set down on paper the sum total of his knowledge and experience with his "little friends," accumulated throughout a period of seventy years, in two thick volumes called "The Social Life of the Ants."

So much has been said about the means of communication between the minute creatures that make up the complex social structure of the ant world that it is interesting to see what he has to say on this fascinating subject. The prominent feature in such communication, of course, is the antenna, though this organ is not the exclusive factor in the function of such senses as smelling as it was once supposed to be. The following is a vocabulary in the antennal language of ants reported by Dr. Forel:

"It is above all an incitement to collective work, passing from one individual to the other.

"By caressing and lightly tapping a companion with her antennae one ant begs and implores the other to regurgitate for her a little honey dew.

"By striking a companion sharply with her antennae and afterwards moving away in a certain direction, an ant that is about to move her quarters invites this companion to follow her to a new nest.

"In a very similar way, an ant which has somewhere discovered a source of food invites her companions to follow her to such a place.

"By violent blows with the antennae, often delivered with her mandibles open, an ant urges her companions to the attack, or, on the other hand, to flight.

"Blows are often given with the antennae by an ant which wishes to warn a companion of a danger coming from a certain direction.

"By friendly antennal caresses, constantly repeated, ants endeavor to calm the affective excitement of one of their companions.

"Slave-making ants give their companions the signal for departure on an expedition by rapid blows with the antennae or head. In the same manner they point out to them a change of direction as soon as hesitation or stoppage has occurred on the march."

In spite of this elaborate system of communication observed by painstaking naturalists, the Swiss entomologist estimates that fully 95 per cent. of the ant's actions are determined by hereditary instinct. Four per cent. are due to what he calls "emotional constellations" and a routine of habits fairly rapidly acquired. This leaves only one per cent. for individual reflection which can modify the ant's actions according to circumstances and special cases. This is a very trifling percentage compared with the proportion of thought and will which, it is estimated, control 60 per cent. of the actions of an adult human being.

Notwithstanding their remarkable hereditary instinct, this lack of reasoning power puts ants at a terrible disadvantage in dealing with the problem of the thousand and one "guests" and hangers-on that are quick to take advantage of the protection and convenience of an elaborate system of communal living. Prominent among these parasitic members of insect society are two or three species of beetles that live in the nests of one group of ants, prevailing upon the workers to feed them the food collected for themselves and their young. Then when it is time to produce their own young they migrate to the formicary of a species of ant more suitable for the depredations of their voracious larvae. The female beetle lays her eggs in this second formicary among the eggs and cocoons of her hosts. These helpless ant infants are immediately devoured by her more forward young ones. In proportion as the brood of ants decreases that of the parasitic beetle increases and is tended with loving care by the worker ants who disgorge for them the partially digested food intended for their own young. For the little thieves are not at all averse to a change of diet.

Dr. Forel relates an amusing incident in this connection that he has personally witnessed several times. There is a slave-making species known as the Amazon ant that goes on warlike raids for the purpose of carrying off larvae and nymphs of one of the varieties of ants that are frequently afflicted with the parasitic beetles, in order to hatch them out for auxiliary workers in their own nests. Not infrequently, declares the entomologist, the Amazon will carry off as booty the larvae of the beetles, "another robber almost certain to pay her back in ample measure by devouring her larvae and slyly appropriating from her slaves the honey dew for which it too has such a craving."

As the ant colony becomes more and more infested by these undesirables there appears in its midst in increasing numbers a curiously degenerate form of worker ant, smaller and less active than its normal sisters, much less capable, of course, of performing its share of the work. An ant queen removed from an infested colony and placed in a healthy one has been found to produce absolutely normal workers, so it is obvious that the deformity is not due to any change in the germ plasm of the eggs. These degenerate forms are found only in the beetle-infested colonies but just what the connection is has not been scientifically worked out as yet.

The reason why these hard-working ants are so taken in by their noxious parasites lies in a curious fact. It is well known that many ants are led by the nose, or rather by the antennae, in their preference for certain odors and foods of especially entrancing smell. Every one is familiar, for instance, with the ability of ants to sniff out honey and sugar, even in the face of formidable barricades. Now, on the backs of these tiny bettles is a group of minute hairs, called trichomes, that give out an aromatic perfume which apparently throws ants into ecstasies of delight, not unlike the response of some human beings to tobacco fumes or strong drink. Microscopic examination has revealed that every trichome is filled with fat cells which secrete the volatile aroma so delightful to the ant. Lured by this seductive odor, she gives up to the wretched intruder the food her social duty to her tribe requires her to give to her own larvae and so brings degeneration on the whole colony.

Not all the ant guests are so deadly. One little beetle performs really useful services in cleaning up the carrion and refuse of the nest and even renders valet services in picking off mites from the bodies of his protectors. Since these beetles are not equipped with the entrancing trichomes, however, they are not so welcome to their respective hosts as the beetles described above are to theirs. Ants, like humans, enjoy being duped.

There are few orders of insects that are not represented among ant guests. They have spiders and cockroaches, even as we, not to mention the members of their own race that inhabit the same nest in various degrees of parasitism. Mimicry, of course, plays an important part in this peculiar social condition among insects, but scientists, who have made (*Turn to next page*)

A Life Among the Ants—*Continued*

A BATTLE BETWEEN ANTS of the same species. . . . . Biting off each other's legs and heads, conflicts sometimes last all day, and the fields of strife are covered with hundreds of dead and wounded

this phase of insect life their special study, have brought out the curious fact that the degree of mimicry on the part of guests is adapted to the quality of the ants' sensations.

"In the case of ants with poor sight," says Dr. Forel, "color-mimicry on the part of the guests is only a rudimentary affair, a rough approximation, but with regard to form, sculpture, hairs and smell, it becomes all the more striking so as to deceive the touch and topochemical smell of ants. There is also a singular mimicry of demeanor, consisting in the activity of the limbs, in the mutual antennal language that passes between the guest and its ant, in caressing the legs, in its manner of eating and allowing or causing itself to be carried about, etc., and this kind of mimicry is not the least successful means of deceiving the ant's social instinct in a fashion that is as hypocritical as it is unconscious."

Among the animals that the ants themselves make use of are the well-known ant cows or aphids. By stroking the pestiferous plant louse with its antennae the ant makes it give up tiny droplets of a sweet liquid exudation, the by-product of semi-digested juices of vegetables and flowers. These pests are cared for so solicitously by some ants that they build shelters for them, miniature cow barns, so to speak, around the bases of the plants where they feed. Others rear and tend the brood of the aphids in their own nests in order to make sure of plentiful herds.

Butterfly caterpillars are the favored cattle of some species. They ride around on their backs like microscopic horsemen and defend them furiously from the attack of other insects. The caterpillars turn into chrysales in the galleries of their ants and are thus secured against their enemies during the helpless pupal stage. The ants protect the chrysalis until it is completely hardened and the caterpillar, in the earlier stages, while it is casting its skin. They likewise render assistance to the emerging butterfly. The secret of this association is not dissimilar to that with the parasitic beetle with trichomes. On the third segment from the end of the caterpillar's back is a tiny slit, which opens from time to time and lets out a minute drop of transparent liquid.

"This liquid is viscous," explains Dr. Forel, "and ants dote upon it. The caterpillar never secretes it except when the ants beg for it or when the creature wishes to appease them. The same caterpillar can secrete it several times a minute or requires a quarter of an hour's coaxing, according to circumstances. Observers assume that it is a sweet liquid, though they have never proved the fact by analysis. Thomann (another entomologist), observed that the secretion came more frequently whenever the caterpillar felt itself in danger. . . . It seems as though it were instinctively trying to please the ant in order to obtain better protection. Thomann thinks it is evident that the honey thus secreted by the Lycaena is one of the principal foods, sometimes the principal food of its ant."

"Go to the ant, thou sluggard; consider her ways, and be wise; which, having no guide, (*Turn to next page*)

Tea for Beer Causes Nervousness

Physiology

Substitution of tea for beer as the national beverage in England has probably been responsible for increased numbers of super-sensitive and neurotic people, in the opinion of the English physiologist, Prof. W. E. Dixon, who addressed the British Association for the Advancement of Science. In fact, the growing tendency in civilized nations to substitute tea and coffee for stronger beverages probably has a bearing on the increased nervous irritability among highly civilized peoples at the present time.

"England was once a drunken nation. Before the revolution the consumption of beer alone in England and Wales was 90 gallons a head per annum; now it is about a quarter of this. With this diminution of beer drinking is associated a truly enormous increase in tea and coffee drinking. To me it seems not unlikely that this substitution of tea for beer is not wholly unconnected with the tendency of highly civilized nations to become supersensitive and neurotic, for this is the groundwork upon which drug addiction is built," said Prof. Dixon.

Prof. Dixon explained that beer is a soothing beverage, while caffeine relieves drowsiness and fatigue by direct stimulation of the brain cells. Unfortunately, it is just the supersensitive people who drink the caffeine beverages like tea and coffee in excess.

"It is easy to understand the modern tendency in some highly civilized nations to indulge in narcotic drugs like morphine, heroin and cocaine," said Prof. Dixon.

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New Museum of Geysers

Geophysics

The most complete geyser exhibit in the world has been installed in the new museum building at Old Faithful, under the supervision of Park Naturalist Dorr C. Yeager. It consists of specimens of the various types of geyser and hot springs deposits and of diagrammatic paintings showing how a geyser works, and of the evolution of a geyser through the geological ages.

Science News-Letter, July 27, 1929

Ergosterol in Mummy

Physiological Chemistry

The brain of an Egyptian mummy dating from about 500 A. D. has been examined by chemists and found to contain ergosterol, the parent substance of vitamin D. This news comes from Drs. H. King, Otto Rosenheim and T. A. Webster, working at the National Institute for Medical Research in London. They find that ergosterol is remarkably stable in animal tissues (brain, gallstones, blood, skin, eggs, etc.), although it is very unstable when separated from other substances. In the animal tissues it is protected by a closely related substance called cholesterol, which was originally thought to be pro-vitamin D.

Ergosterol has now been found in conjunction with cholesterol in a mummy brain which is about 1,400 years old. The brain was of Coptic origin, and was removed from one of the bodies found in tombs in Antinoe, Upper Egypt. No embalming process had been used, and the organs of the body were preserved in their original position, but of course shrunk and mummified under the influence of the dry atmosphere of Egypt.

Science News-Letter, July 27, 1929

A Life Among the Ants—*Continued*

overseer, or ruler, provideth her meat in the summer and gathereth her food in the harvest."

These remarks of Solomon's have furnished the nub of many a sermon and, in the early days of entomology, the source of much wrinkling of learned brows and waggling of learned beards. For the ants of northern Europe and America do not follow the praiseworthy habits of their sisters in Palestine and the Mediterranean region. Consequently, discussion over entomological passages in classical writers waxed warm, until about the middle of the eighteenth century, when some naturalist had a bright idea and predicted that ants in hot and cold countries would have different habits.

As a matter of fact, it is not for the short, mild winter that the harvesting ants gather seeds in their granaries, but for the dry season, when they can find nothing else to eat. There used to be a legend that such ants sowed their own grain and then stored their harvest away in their subterranean galleries. Recent observations show, however, that the grain patches around their formicaries are due to seeds that have sprouted and taken root after being accidentally dropped or thrown out with other nest refuse.

The mushroom-growing ants of South America constitute another tribe that kept their food habits a secret from investigators for many years. They were known chiefly on the plantations in the tropics for their leaf-cutting propensities. They cut off pieces of leaves and carried off great quantities to their nests, choosing usually for the scene of their depredations, plants cultivated by man. It was generally believed that the leaves were used to line their nests. Eventually, indefatigable entomologists unearthed the information that the fodder they dragged off was cut up in little pieces and used to bed down their underground fungus gardens. Some species have been found unable to live without their mushroom diet while at least one species of the mushroom so cultivated proved unable to reproduce and multiply without the care and attendance of the ant-gardeners.

The weaving ants have solved the problem of making a home by utilizing the special gifts of their cocoon-spinning larvae. Every worker seizes a larva in her jaws, and together with her squad of companions which are doing likewise, carries it to a place between two leaves, fixing its mouth to the edge of one leaf. Meanwhile another squad pulls with all its strength to draw one leaf towards the other, each worker grasping it by the one edge and hanging on to the other with all six legs at the same time. The final result is a compact nest of close and regular silken tissues woven between the leaves. The larvae are provided with relatively enormous silk glands. When the leaves are so far apart that their edges cannot be seized by the same workers, the ants form chains, each ant taking hold of the other until the first is able to hold the other end of the other edge between her six legs. Both then pull the two leaves towards each other, while the other squad of ants weaves with its larvae, if necessary, utilizing the chain of the first squad as a bridge.

This is an example almost unique in nature, Dr. Forel points out, of the use of one living creature by another as a working tool. Certainly such teamwork has few parallels.

Science News-Letter, July 27, 1929

The Story of American Crime

Criminology

By Marjorie Van de Water

Three and one-half billion dollars is the estimated annual cost of crime! A billion more than the annual wholesale cost of our automobiles. A billion and a half more than is spent for public school education. More than three and a half times the value of our annual wheat crop. This is the tremendous toll of crime in the United States. And this is a very conservative estimate. Others run as high as 13 billions.

By far the largest part of this estimate is the amount believed to be directly taken over by the criminals through theft and fraud. And this may be considered as a double loss, for it not only impoverishes the law-abiding, tax-paying citizen, but adds stupendously to the power of the outlaw. For this figure, we must depend on the estimate of insurance companies based on premiums paid. In the absence of accurate statistics it provides the best guess and probably is reasonably reliable. William F. Joyce, Chairman of the National Surety Company, gives these figures as his best estimate:

Burglars	$225,000,000
Bandits	50,000,000
Common thieves	150,000,000
Embezzlers	125,000,000
Fraudulent bankrupts and credit swindlers	100,000,000
Forgers and check raisers	125,000,000
Stock and land frauds and confidence games	200,000,000

The total gives us the huge figure of two billion seven hundred and seventy-five million dollars handed over annually to criminals by the American people. Large as this loss is to the public, however, it does not mean that crime is a paying business to the criminal. If two per cent. of the total population is a correct estimate of the criminal element, then the average individual income derived from crime is only $1,156.25. The average income per person gainfully employed in the United States is $1,805.37.

Another seven hundred and thirty-five million dollars is spent annually for the administration of justice. This goes for the upkeep of jails and prisons, for the courts and police departments, for all the complex machinery necessary to catch the criminal and punish him.

To spend three and a half billion dollars in this way is like placing property of that value on a huge bonfire which would completely destroy it. It is probably the greatest waste of our age.

The number of commitments to prison is high enough to alarm any community. Suppose, for the moment, we consider that the commitment of a person to prison means the cessation of his usefulness to society. We may then compare the rate of those lost to society in this way with those lost through death from various causes. In 1923, 325.1 persons were committed to prison from every 100,000 of population. This rate is greater than for any single cause of death. It is 1.85 times as high as the rate of death from heart disease, the most important cause of death. It is 3.63 times as high as the rate of death from cancer. More persons died in 1923 from homicide than from typhoid and paratyphoid fever or from scarlet fever. In 1925 more persons were murdered than died of any of the following diseases: typhoid fever, measles, scarlet fever, whooping cough, diphtheria. Preventive medicine has reduced the deaths from many communicable diseases. It is now time to devise a preventive criminology which will reduce the rate of deaths from homicide.

For how much crime are the mentally defective or mentally diseased responsible?

A very recent expression on the subject from an authoritative source is that contained in a leading editorial in the Mental Hygiene Bulletin published by the National Committee for Mental Hygiene. The quotation follows:

"It is estimated that about two per cent. of the general population are mentally defective. That is, about one-fiftieth are more or less lacking in brains. But this one-fiftieth produces one-fourth or one-third of the prison population; so that, as a matter of fact, there are many more criminals drawn from the mentally defective classes in proportion to their percentage of the general population than from the rest, even though they actually represent only a fraction of the prison group. . . . The mentally defective are potentially greater risks because of their mental handicaps than the more intellectual groups, and they need protection, training of a special sort, and supervision to steer them into blameless living."

Dr. William Healy, in a careful study of delinquent and problem children for the Judge Baker Foundation, discovered that 72.5 per cent. were of normal mentality, the others being feeble-minded, subnormal, insane, or psychopathic. In Chicago the proportion of the abnormal was higher. There it reached 37 per cent. He also found that the abnormal were more likely to remain criminalistic despite special training and care after the delinquency. He says:

"The causes for failure as well as for success are undoubtedly complex in every case, but it is striking to find that in 52 per cent. of the failures diagnoses had earlier been made of abnormal mentality or personality."

From the normal group he reports 180 successes to 65 failures, while from the others there were only 60 successes to 81 failures. The group showing psychoses or psychopathic personalities contained only 11 successes to 28 failures.

Dr. Bernard Glueck, when he was director of the Psychiatric Clinic at Sing Sing prison, made the following analysis of the prison population there. He found that 59 per cent. showed some form of nervous or mental abnormality. Of the sexual offenders, considered as being the most serious menace to society, 70 per cent. were mentally pathological.

The proportion who were repeaters was particularly high among the abnormal. Of the mentally defective 80 per cent. were repeaters, of the insane 63 per cent. were old offenders, and of the psychopathic 87 per cent. had been in prison before.

Dr. Glueck also found that the extent of psychopathologically classifiable cases is in direct ratio to the seriousness of the offense. Of the criminals guilty of acquisitive crimes, such as larceny and burglary, 57 per cent. were abnormal, those guilty of crimes of pugnacity were 59 per cent. abnormal, and of those guilty of sex offenses 70 per cent. were not normal mentally.

As a result of these findings it has been suggested that proper care of the mentally abnormal will reduce crime and the number of criminals.

If the population of the state and federal prisons is representative of the criminal population as a whole, then the group contains fewer foreign-born than native Americans. Even if we take into account the difference between the total number of native and the total number of foreign born in the country (*Turn to next page*)

Crime—*Cont'd*

(of course, the foreign-born element represents only a relatively small proportion of the total), still the foreign-born do not contribute quite their quota to the prisons. The exact figure, as found by H. H. Laughlin of the Carnegie Institution of Washington for the Congressional Committee on Immigration is 98.5 per cent of what might be expected on a basis of pure chance.

This figure will surprise a great many who have been led to believe that the proportion is much higher. Nevertheless, it is not to be considered as low. Our immigration laws are designed to exclude undesirable aliens, and they cannot be considered as fulfilling their purpose while the rate of crime among the immigrants is practically equal to that among our own native born. Would a law designed to prevent the importation of certain manufactured products be considered effective if 13.8 per cent. of those products on sale in the stores of this country were of foreign manufacture?

It is assumed that those individuals who come to our shores will be willing to keep our laws. Criminals cannot be classed as other than undesirable. Yet 13.8 per cent. of our prisoners in 1923 were of foreign birth. And it has been estimated that more than three-fifths of them are either foreign or the children of foreign parents.

The second generation of aliens is no less criminalistic than those freshly landed. The children of one native and one foreign-born parent exceed their quota by 15.58 per cent. Those having two native parents, on the other hand, fall short of the number which might be expected by 18.16 per cent. If we had a record of the number whose grandparents were native born, we might find the rate still smaller.

Not all countries contribute in the same degree to our crime problem. For example, Switzerland, Ireland, and Germany contribute respectively only 27, 31, and 35 per cent. of their quotas to the criminal institutions. Contrasted with this moderate record are the figures for Mexico, Spain and Serbia. These countries contribute 549 per cent., 660 per cent., and 1400 per cent. of their quotas. Northwestern Europe contributes only 38 per cent. of its quota; Southern and Eastern Europe, 141 per cent.; Asia, 252 per cent., and the Balkan States, 276 per cent.

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SCIENCE SERVICE

2101 B Street Washington, D. C.

Manchurian Railroad Key to Resources

Economics

The Chinese Eastern Railroad in Manchuria, over the control of which a war is threatening, is the key which can make available an enormous wealth of natural resources at present locked up beneath the soil and in the forests of Manchuria.

Iron and gold are said to be present in large quantities, although at present these resources remain practically untouched. There are two iron mines in southern Manchuria, one operated by the South Manchuria Railroad. In the northern region there are none. Gold is washed on the tributaries of the Amur River up near the boundary of Russia, but the gold washers take only the most accessible metal, and then go elsewhere. There are as yet no mines of any importance in the whole northern region which is reached by the Chinese Eastern Railroad.

Manchuria is rich in coal. In the northern section 70 mines are in operation, but only four of these are modern mines. The majority are very primitive workings with an annual output of only a few hundred tons. The four principal mines are operated by Russian, Japanese, and English capital. In southern Manchuria the principal coal mine is operated by the South Manchuria Railroad and has an output of 4,900,000 tons a year. Three other mines in this district have annual outputs of over a hundred thousand tons. The rest are all small workings that barely scratch the surface.

Another valuable natural resource of Manchuria is the large stand of timber. Northern Manchuria contains the great forests which were formerly reserved as hunting grounds for the Manchu princes. The largest forests are those along the Great Khingan Mountains in the northwestern part of the country. The Chinese Eastern Railway cuts right through these mountains.

It is estimated that there are about six billion trees in the Manchurian forests, containing about one hundred and twenty-six billion feet of timber or about one-third as much timber as there is in the whole United States. The trees are pine, oak, and willow and they grow to a very large size. Many are 13 to 14 feet in circumference and more than 100 feet high.

Manchuria, especially the northern part through which runs the disputed Chinese Eastern Railway, is the golden land of opportunity for Asia. This area, once the hunting ground of the Manchu princes, is now the Promised Land for thousands of immigrants. They are hunting not merely the wild game which still abounds, but the fertile land for farms and homes.

HOW MANCHURIA WOULD LOOK if it were slid along the same parallel of latitude and dropped on North America. Port Arthur, the gateway of this rich slice of territorial pie for which Russia, China and Japan have been struggling for decades, lies as far south as Washington; Mukden would be near Pittsburgh and Harbin not far from Montreal. The northern boundary would cut across the southern end of Hudson Bay

Last year about 1,500,000 people flocked from the war-torn and famished parts of China to the part of Manuchuria that is served by the Chinese Eastern Railway. It is estimated, however, that about two-thirds of this territory still remains uncultivated. About forty-five million acres of rich arable land in North Manchuria are yet untouched by the plow.

Like the early settlers of our West, the pioneer in Manchuria must face the perils of banditry from tribes not unlike the Indians in their habits. But like our own colonists, he has the advantage of virgin land and a healthful, temperate climate.

Dairen is the principal port of Manchuria and is located in the southernmost tip of the country. This city is in about the same latitude as Washington, D. C. The northern extreme of the country is in the latitude of Hudson Bay. The greatest distance east and west across the country is about the same as the distance from New York to Chicago.

Altogether the area of Manchuria is equal to that of the New England States, the Middle Atlantic States, and also Ohio, Indiana, Michigan, Delaware, Maryland, and West Virginia. The population, however, is only half that of this section of the United States. The total length of the railways serving this land to which hordes are flocking is only 3,500 miles. In the equivalent area in the United States there are sixty thousand miles.

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A recent forest fire that swept across the Mexican border into Arizona was set down on the official rangers' record as "imported from Mexico".

Prosperity Threatens Species

Biology

Prosperity, easy living, no need to struggle very hard, have been cited as the underlying causes of the decay and downfall of historic civilizations like Rome and Persia, and are being regarded with some anxiety for modern parallels by modern philosophers. Comparable conditions hold in the natural world, according to Prof. O. Abel of the University of Vienna, who spoke before the meeting of the British Association for the Advancement of Science.

The early stages of the evolution of a species, he said, are apt to be marked by signs of a battle with a hard and unfavorable environment, which will let the fittest survive, but will ruthlessly scrape off the less fit. But after the species has conquered its place in the sun, or if the climate or other environmental factors themselves become changed for the better, second-rate individuals survive along with the strong and fit, and by crossing with them perpetuate their own defects and drag down the general level of the whole race.

Professor Abel found a striking example of his thesis in the bones of a certain extinct species of cave bear, found by thousands in an Austrian cavern. The fossils in the lower layers, marking the early days of the species, were all strong, healthy, vigorous animals; but among the bones farther up in the deposit, laid down during the days of fat living for cave bears, there were bones indicating that even crippled, diseased and dwarfed bears were able to make a living. And finally there were no bear bones left in the cave at all—the species had degenerated and become extinct.

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Wetting Safest in Storm

Meteorology

If you are out in the open and a thunderstorm suddenly comes up, don't raise your umbrella to keep dry. Go to as low a place as possible, sit down, or even lie down. Then you may get soaked to the skin, but you will probably not be struck by lightning.

This is the advice of Dr. W. J. Humphreys, professor of meteorological physics at the U. S. Weather Bureau, given to Science Service in commenting on the recent deaths of three people by lightning on a Montreal golf course when their umbrella was struck.

"Personally, I would prefer the ducking to the risk of being killed," said Dr. Humphreys.

A low place is safer than the top of a hill, and the lower the person is the safer he is. Nothing should be held above the head. A few years ago a man on a Washington golf course was killed when lightning struck his golf sticks held over his shoulder. If a person lies down on the ground there will be little danger. It may be uncomfortable to be soaked, but the wetting is a further protection. Wet clothes are a pretty good conductor, so the lightning will be carried off, even if the person is struck. If the clothes are dry, the current will probably travel through the body—with fatal results.

An isolated tree is an exceedingly dangerous shelter in a thunderstorm, said Dr. Humphreys. A small tree in a wood is reasonably safe, however.

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Joy, as well as grief and anger, may upset digestion, according to recent experiments.

Light Affects Use of Salts

Plant Physiology

Plants need comparatively minute amounts—often mere traces—of certain elements such as boron, zinc, copper and manganese, in addition to the larger quantities of the more familiar things such as phosphorus, potassium and calcium. The quantities of these "trace minerals" that will benefit any given plant seem to be governed by the intensity of the sunlight under which it is growing, according to Dr. Winifred E. Brenchley of the great British agricultural laboratory at Rothamstead, who spoke before the meeting of the British Association for the Advancement of Science.

Too bright sunlight appears to increase the harm done by the absence of some of these lesser elements, Dr. Brenchley said. One somewhat puzzling practical aspect of the problem has been that the benefits of copper applications to peat soils in Florida, a treatment much used in the truck-farming regions, can not be duplicated by similar treatment of peat soils in England.

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Old Constantinople Church

Archaeology

The most ancient Christian church in Constantinople, one of the churches which vies for the honor of having possessed the head of John the Baptist, is now being excavated. The edifice, known as the Church of St. John of the Studium, was built in 463 by a Roman senator named Studius. Its long and eventful career was terminated definitely when a fire and later a heavy snowfall wrecked it in the past century.

Authorities of the museum at Stamboul have undertaken to restore the ruins, according to a report in the British journal, *Discovery*, and the place has now become one of the most beautiful of the ancient monuments in Constantinople.

The interior of the church has been cleared of tall weeds, and the mosaic marble floor can be seen. Large portions of the mosaic patterns are missing, because at one time tourists carried off bits of flooring as souvenirs. The remaining patterns are formal geometric designs and figures of strange animals, some heraldic and some naturalistic. This mosaic apparently dates from the Middle Ages when the church was repaired.

The columns at the entrance have been cleaned of plaster and whitewash which the Turks spread over them in later centuries when the old church was turned into a mosque. The columns so revealed are of green marble, with finely carved Corinthian capitals.

In its earliest days the church was attached to a monastery of the so-called "Sleepless Ones," an order which held services day and night unceasingly by a relay system.

Various emperors paid visits of state to the Church of St. John in the centuries when it was an outstandingly important institution.

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CLASSICS OF SCIENCE:

Prout's Hypothesis

Physics—Chemistry

That the one element sought so diligently by the Greeks and the Alchemists might prove to be the familiar hydrogen seemed probable to Prout, but he could not prove it. He published his hypothesis anonymously in a magazine devoted more to amateur's observations and shop recipes than to researches in "pure science." The hypothesis remained an interesting though rather wild theory until revived by F. W. Aston in the light of modern discoveries in the structure of the atom.

On the Relation between the Specific Gravities of Bodies in their Gaseous State and the Weights of their Atoms. Annals of Philosophy, November, 1815.

The author of the following essay submits it to the public with the greatest diffidence; for though he has taken the utmost pains to arrive at the truth, yet he has not that confidence in his abilities as an experimentalist as to induce him to dictate to others far superior to himself in chemical acquirements and fame. He trusts, however, that its importance will be seen, and that some one will undertake to examine it, and thus verify or refute its conclusions. If these should be proved erroneous, still new facts may be brought to light, or old ones better established, by the investigation; but if they should be verified, a new and interesting light will be thrown upon the whole science of chemistry.

It will perhaps be necessary to premise that the observations about to be offered are chiefly founded on the doctrine of volumes as first generalized by M. Gay-Lussac; and which, as far as the author is aware at least, is now universally admitted by chemists. . . .

Hydrogen.—The specific gravity of hydrogen, on account of its great levity, and the obstinacy with which it retains water, has always been considered as the most difficult to take of any other gas. These obstacles made me (to speak in the first person) despair of arriving at a more just conclusion than had been before obtained by the usual process of weighing; and it occurred to me that its specific gravity might be much more accurately obtained by calculation from the specific gravity of a denser compound into which it entered in a known proportion. Ammoniacal gas appeared to be the best suited to my purpose, as its specific gravity had been taken with great care by Sir H. Davy, and the chance of error had been much diminished from the slight difference between its sp. gr. and that of steam. Moreover, Biot and Arrago had obtained almost precisely the same result as Sir H. Davy. The sp. gr. of ammonia, according to Sir H. Davy, is ·590164, atmospheric air being 1·000. We shall consider it as ·5902; and this we are authorized in doing, as Biot and Arrago state it somewhat higher than Sir H. Davy. Now ammonia consists of three volumes of hydrogen and one volume of azote condensed into two volumes. Hence the sp. gr. of hydrogen will be found to be .0694, atmosphere air being 1.0000. It will be also observed that the sp. gr. of oxygen as obtained above is just 16 times that of hydrogen as now ascertained, and the sp. gr. of azote just 14 times.

Chlorine.—The specific gravity of muriatic acid, according to Sir H. Davy's experiments, which coincide exactly with those of Biot and Arrago, is 1·278. Now if we suppose this sp. gr. to be erroneous in the same proportion that we found the sp. gr. of oxygen and azote to be above, (which, though not rigidly accurate, may yet be fairly done, since the experiments were conducted in a similar manner), the sp. gr. of this gas will come out about 1·2845; and since it is a compound of one volume chlorine and one volume hydrogen, the specific gravity of chlorine will be found by calculation to be 2·5. Dr. Thomson states, that he has found 2·483 to be near the truth, and Gay-Lussac almost coincides with him. Hence there is every reason for concluding that the sp. gr. of chlorine does not differ much from 2·5. On this supposition, the sp. gr. of cholrine will be found exactly 36 times that of hydrogren.

On the Specific Gravities of Elementary Substances in a Gaseous State that do not at ordinary Temperatures exist in that State.

1. *Iodine.*—I had some reason to suspect that M. Gay-Lussac had in his excellent memoir rated the weight of an atom of this substance somewhat too high; and in order to prove this 50 grains of iodine, which had been distilled from lime, were digested with 30 grs. of very pure lamellated zinc. The solution formed was transparent and colourless; and it was found that 12·9 grains of zinc had been dissolved. 100 parts of iodine, therefore, according to this experiment, will combine with 25·8 parts of zinc, and the weight of an atom of iodine will be 155, zinc being supposed to be 40. From these data, the sp. gr. of iodine in a state of gas will be found by calculation to be 8·611111, or exactly 124 times that of hydrogen.

2. *Carbon.*—I assume the weight of an atom of carbon at 7·5. Hence the sp. gr. of a volume of it in a state of gas will be found by calculation to be ·4166, or exactly 12 times that of hydrogen.

3. *Sulphur.*—The weight of an atom of sulphur is 20. Hence the specific gravity of its gas is the same as that of oxygen, or 1·1111, and consequently just 16 times that of hydrogen.

4. *Phosphorus.*—I have made many experiments in order to ascertain the weight of an atom of this substance; but, after all, have not been able to satisfy myself, and want of leisure will not permit me to pursue the subject further at present. The results I have obtained approached nearly to those given by Dr. Wollaston, which I am therefore satisfied are correct, or nearly so, and which fix phosphorous at about 17·5, and phosphoic acid at 37·5, and these numbers at present I adopt.

5. *Calcium.*—Dr. Marcet found carbonate of lime composed of 43·9 carbonic acid and 56·1 lime. Hence as 43·9 : 56·1 :: 27·5 : 35·1, or 35 very nearly; and $35 - 10 = 25$, for the atom of calcium. The sp. gr. of a volume of its gas will therefore be 1·3888, or exactly 20 times that of hydrogen.

6. *Sodium.*—100 grains of dilute muriatic acid dissolved 18.6 grs. of carbonate of lime, and the same quantity of the same dilute acid dissolved only 8·2 grs. of carbonate of lime, after there had been previously added 30 grs. of a very pure crystallized subcarbonate of soda. Hence 30 grs. of crystallized subcarbonate of soda are equivalent to 10.4 grs. of carbonate of lime, and as 10·4 : 30 :: 62·5 : 180. Now 100 grs. of crystallized subcarbonate of soda were found by application of heat to lose 62·5 of water. Hence 180 grs. of the same salt contain 112·5 water, equal to 10 atoms, and 67·5 dry subcarbonate of soda, and $67·5 - 27·5 = 40$ for the atom of soda, and $40 - 10 = 30$ for the atom of sodium. Hence a volume of it in a gaseous state will weigh 1·6666, or exactly 24 times that of hydrogen.

7. *Iron.*—100 grs. of dilute muriatic acid dissolved as before 18·6 grs. of carbonate of lime, and the same quantity of the same acid dissolved 10·45 of iron. Hence as 18·6 : 10·45 :: 62·5 : 35·1, or for the sake of analogy, 35, the (*Turn to next page*)

Physiological Congress at Boston

Physiology

American physiologists will be the hosts of one of the most distinguished groups of European scientists who have ever come to this country, when the Thirteenth International Physiological Congress meets here from the nineteenth to the twenty-third of next month. Word has been received from England that 300 reservations are being held on the liner *Minnekahda*, which sails from London on August 9 and from Boulogne on August 10, reaching Boston the day before the opening of the Congress. In addition to the large block of foreign delegates who will come on this ship, there will undoubtedly be many others who will sail at an earlier date, and a considerable number of European physiologists already visiting in this country. The number of members expected from the United States, Canada and Mexico has not yet been estimated, but it is probable that the total attendance at the Congress will be well over the thousand mark.

The International Physiological Congresses have been important events in the scientific world for more than a generation. The first one was held at Basel, Switzerland, in 1889, and since then the meetings have taken place regularly at three-year intervals, with the exception of an interruption due to the war. The last one was held in Stockholm in 1926. Other meeting places have been Liege, Bern, Cambridge, Turin, Brussels, Heidelberg, Vienna, Groningen, Paris and Edinburgh.

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Prout's Hypothesis—*Continued*

weight of an atom of iron. The sp. gr. of a volume of this metal in a gaseous state will be 1·9444, or exactly 28 times that of hydrogen.

8. *Zinc.*—100 grs. of the same dilute acid dissolved, as before, 18·6 of carbonate of lime and 11·85 of zinc. Hence as 18·6 : 11·85 :: 62·5 : 39·82, the weight of the atom of zinc, considered from analogy to be 40. Hence the sp. gr. of a volume of it in a gaseous state will be 2·222, or exactly 32 times that of hydrogen.

9. *Potassium.*—100 grs. of the same dilute acid dissolved, as before, 18·6 carbonate of lime; but after the addition of 20 grs. of super-carbonate of potash, only 8·7 carbonate of lime. Hence 20 grs. of super-carbonate of potash are equivalent to 9·9 carbonate of lime; and as 9·9 : 20 :: 62·5 : 126·26, the weight of the atom of super-carbonate of potash. Now 126·26 — 55 + 11·25 = 60, the weight of the atom of potash, and 60 — 10 = 50, the weight of the atom of potassium. Hence a volume of it in a state of gas will weigh 2·7777, or exactly 40 times as much as hydrogen.

10. *Barytium.*—100 grs. of the same dilute acid dissolved exactly as much again of carbonate of barytes as of carbonate of lime. Hence the weight of the atom of carbonate of barytes is 125; and 125 — 27·5 = 97·5, the weight of the atom of barytes, and 97·5 — 10 = 87·5, the weight of the atom of barytium. The sp. gr. therefore, of a volume of its gas will be 4·8611, or exactly 70 times that of hydrogen.

With respect to the above experiments, I may add, that they were made with the greatest possible attention to accuracy, and most of them were many times repeated with almost precisely the same results.

The following tables exhibit a general view of the above results, and at the same time the proportions, both in volume and weight, in which they unite with oxygen and hydrogen: also the weights of other substances, which have not been rigidly examined, are here stated from analogy. . . .

On a general review of the tables, we may notice,

1. That all the elementary numbers, hydrogen being considered as 1, are divisible by 4, except carbon, azote, and barytium, and these are divisible by 2, appearing therefore to indicate that they are modified by a higher number than that of unity or hydrogen. Is the other number 16, or oxygen? And are all substances compounded of these two elements?

2. That oxygen does not appear to enter into a compound in the ratio of two volumes or four atoms.

3. That all the gases, after having been dried as much as possible, still contain water, the quantity of which, supposing the present views are correct, may be ascertained with the greatest accuracy.

Others might doubtless be mentioned; but I submit the matter for the present to the consideration of the chemical world.

Correction of a Mistake in the Essay on the Relation between the Specific Gravities of Bodies in their Gaseous State and the Weights of their Atoms.—Annals of Philosophy, February, 1816.

. . . There is an advantage in considering the volume of hydrogen equal to the atom, as in this case the specific gravities of most, or perhaps all, elementary substances (hydrogen being 1) will either exactly coincide with, or be some multiple of, the weights of their atoms; whereas if we made the volume of oxygen unity, the weights of the atoms of most elementary substances, except oxygen, will be double that of their specific gravities with respect to hydrogen. The assumption of the volume of hydrogen being equal to the atom will also enable us to find more readily the specific gravities of bodies in their gaseous state (either with respect to hydrogen or atmospheric air), by means of Dr. Wollaston's logometric scale.

If the views we have ventured to advance be correct, we may almost consider the *prote yle* of the ancients to be realised in hydrogen; an opinion, by the by, not altogether new. If we actually consider this to be the case, and further consider the specific gravities of bodies in their gaseous state to represent the number of volumes condensed into one; or, in other words, the number of the absolute weight of a single volume of the first matter *prote yle*, which they contain, which is extremely probable, multiples in weight must always indicate multiples in volume, and *vice versa;* and the specific gravities, or absolute weights of all bodies in a gaseous state, must be multiples of the specific gravity or absolute weight of the first matter (*prote yle*) because all bodies in a gaseous state which unite with one another unite with reference to their volume.

William Prout (1785-1850) was a physician who was especially interested in chemistry. He discovered hydrochloric acid in the gastric juice. His famous "Hypothesis" was published when its author was 30 years old. It has furnished the theme for much speculation for more than a century, and now seems to have found its place in the newer theories of the formation of matter.

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First Glances at New Books

CANADIAN JOURNAL OF RESEARCH—Issued by the National Research Council of Canada ($3 a year). Dated May, 1929, the first number of a new scientific journal from our sister commonwealth has a most promising look. It is designed, the foreword states, to make room for the more prompt publication of papers resulting from the scientific activities of the National Research Council of Canada and of the Canadian universities and other scientific agencies, many of which have had to wait long periods for their turn in foreign journals. The issue at first will be bi-monthly, but it is anticipated that monthly publication will be undertaken in the near future. The first issue contains papers on rust resistance in wheat, the hydration of aluminates of calcium, anti-tuberculosis vaccination and the effects of ultra-violet light on marine organisms.

General Science
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(1) THROUGH MOUNTAIN, LAKE, AND GORGE WITH THE GEOLOGISTS; (2) TREES AND FLOWERS OF SPRING—*University of Pittsburgh* (60 cents each). These are two paper-bound books consisting of radio talks given by members of the faculty of the University of Pittsburgh, and constituting numbers 51 and 52 of the interesting popular series that has been growing at the University by this means.

General Science
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THE ROMANCE OF MODERN EXPLORATION—Fitzhugh Green—*American Library Association* (35c.). The co-author, with Charles Lindbergh, of "We", gives us a glimpse of the most interesting modern adventures into the unknown parts of the globe.

Geography
Science News-Letter, July 27, 1929

THE CHILD, THE FAMILY, AND THE COURT—PART I, GENERAL FINDINGS AND RECOMMENDATIONS—Bernard Flexner, Reuben Oppenheimer, and Katherine F. Lenroot—*Children's Bureau, United States Department of Labor* (16c.). A study of the administration of justice in the field of domestic relations. It contains an excellent biography on the problems of the family and on juvenile courts and delinquency.

Sociology
Science News-Letter, July 27, 1929

MENTAL HYGIENE—Frankwood E. Williams, M. D.—*American Library Association* (35c.). A brief introduction to mental hygiene by an authority on psychiatry. It contains a guide to five other readable books on this subject.

Psychiatry
Science News-Letter, July 27, 1929

THE UNITED STATES IN RECENT TIMES—Frederic L. Paxson—*American Library Association* (35c.). A guide to some of the best books on our own country, arranged to outline a consecutive reading course.

History
Science News-Letter, July 27, 1929

THE EUROPE OF OUR DAY—Herbert Adams Gibbons—*American Library Association* (35c.). Gives the reader a background for the understanding of events happening in Europe today.

History
Science News-Letter, July 27, 1929

PREHISTORIC MAN—George Grant MacCurdy—*American Library Association* (35c.). Introducing John Doe to his ancestors of the Stone, Bronze, and other bygone ages.

Anthropology
Science News-Letter, July 27, 1929

THE FERNS OF TENNESSEE—W. A. Anderson, Jr.—*University of Tennessee Press.* With the development of the first large National Park east of the Rockies in the Great Smoky Mountains of Eastern Tennessee and Western North Carolina, the botany of Tennessee assumes a new importance for naturalists the country over. Mr. Anderson has done a service in getting information about the particularly rich fern flora of this region into compact and easily handled form.

Botany
Science News-Letter, July 27, 1929

SOME TRIBAL ORIGINS, LAWS, AND CUSTOMS OF THE BALKANS—M. E. Durham—*Macmillan* ($6.50). The last stronghold of the tribal system in Europe has been the Balkans. Here even today prevail customs, political organizations, and superstitions that sound to our incredulous ears like strange bits of life from old barbaric Europe or even ideas from primitive natives of the South Seas. It is fortunate that the material in this volume has been collected before the old regime vanishes, and that the task was undertaken with such thoroughness. The author is a British woman.

Ethnology
Science News-Letter, July 27, 1929

NATURE RAMBLINGS

By FRANK THONE

Black Nightshade

"Deadly nightshade" popular opinion makes it in many sections, but botanists are more non-committal and call it merely "black nightshade". It can be found now in almost any open, weedy field: a straggling plant with leaves like tomato or potato leaves, only thinner and smoother, and star-shaped white flowers like potato flowers, only smaller and narrower-pointed. These will be followed by small round berries, green at first, then purplish black, filled with pulp and tiny seeds.

There is at least one part of the country where the black nightshade is not regarded as deadly. That is out on the plains of the Dakotas, Nebraska and Kansas. The early settlers in these hard lands had few fruits, and their good wives experimented with all of the native berries the country afforded. They very soon learned that the black berries of the nightshade were not only not poisonous but that they made very good pies and jam. Though that region is more settled now, and cultivated fruits are plentiful, the art of nightshade preserves has not yet departed.

It is not unnatural that the nightshade should yield edible fruits. That is the privilege of many members of its family. The tomato is an outstanding example, and the ground cherry a somewhat less conspicuous one. The potato is another nightshade food though here the underground stems rather than the fruits are eaten.

It is notable, however, that while this plant family yields good food products, its leaves are frequently exceedingly poisonous. Even potato and tomato leaves have been known to cause serious poisoning in stock, and the poison of the tobacco leaf, in very dilute form, is the cause of the comfort derived by the smoker from his "weed".

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The Public Has a Right to Know—

Once the scientist worked in garret or secret den, concealing his discoveries from common men, priests, and kings who did not understand.

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To translate science for the man in the street is the task of Science Service. It is the unique institution established for the purpose of disseminating scientific information to the public. It acts as a liaison agency between scientific circles and the world at large. It interprets original research and reports the meetings of learned societies in a way to enlighten the layman. The specialist is likewise a layman in every science except his own and he, too, needs to have new things explained to him in non-technical language.

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In a democracy like ours it is particularly important that the people as a whole should so far as possible understand the aims and achievements of modern science, not only because of the value of such knowledge to themselves but because research directly or indirectly depends upon popular appreciation of its methods. In fact the success of democratic institutions, as well as the prosperity of the individual, may be said to depend upon the ability of people to distinguish between science and fakes, between the genuine expert and the pretender.

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